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ABSTRACT

The discipline of teacher education and technology is poised to leave poor research behind and to remove the false wall between qualitative and quantitative methods of describing, predicting, and controlling education. The arguments used by Dewey early in the century against the dualisms of his day are still powerful and have a bearing on the qualitative/quantitative dualism (QQD). Dewy insisted that the world does not exist in a binary mode. Modern theorists who argue for the primacy of quantitative data over qualitative data have made a mistake made by Kant more than 300 years ago, that of the distinction between analytic and synthetic truths. Quantitative researchers may argue that numbers bring the researcher closer to the truth than qualitative inquiry, but quantitative research actually depends on a very few ambiguous words to describe its findings. Much of educational research is tied to the QQD, but there is no reason that those working in teacher education and technology research must subscribe to previous categories. Alternative vocabularies can be created to help preservice teachers engage in their own research questions that result in their own stories and their self-descriptions of what they hope to become as teachers. The vocabularies created by the QQD limit researchers' and teachers' ways of discovery. (Contains 18 references.) (SLD)

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The Legend of the Qualitative/Quantitative Dualism: Implications for Research in Technology and Teacher Education

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The danger of our dialogues was hidden in the language itself, not in *what* we discussed, nor in the *way in which* we tried to do so.

--Martin Heidegger

I have argued elsewhere (Tellez, 1993) that the discipline of teacher education and technology has the unique opportunity to begin inquiry anew with refined research agendas while leaving behind the poor methodology which has historically plagued teacher education research. In this paper, I argue that we are not only poised to leave behind poor research, but that we can responsibly remove a false wall recently erected by education researchers: the qualitative/quantitative dualism (QQD). By showing that the QQD, which has divided the faculty in many colleges of education and prompted dozens of articles arguing for the use of one or both strategies, is a vestige of Kantian thinking, recently dismantled by contemporary philosophy. I will argue that teacher education and technology can now transcend the debate and advance a research agenda free of its limiting constraints.

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The rift in qualitative and quantitative methods of describing, predicting, even controlling education has grown wider in recent years, in spite of attempts to "close it down" (Smith & Heshusius, 1986). It seems that some of those who study human behavior have reached an uneasy truce, yet for some researchers it appears that the division is deeper than ever. Educational researchers, in particular, have now developed two separate lines of research, often existing in the same department, battling for graduate students who will use their methods. Why does this dualism come so forcefully now and why do

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we take so much notice of it? In this paper, I will argue that the use of the QQD in the maneuvers for primacy in describing the reality of teaching and learning is not only a false one but one that prevents us from other vocabularies, which may be better at describing what people do in education. At the heart of my analysis is the view that words and numbers are two of our representational resources, and that both are metaphors (in broadest terms) for describing action. In unpacking the QQD and suggesting a world free and untethered from it, I will make the following points:

I. Early in this century, Dewey forcefully attacked the dualisms of his day (child vs. curriculum, knowing vs. doing, theory vs. practice). His arguments are still powerful and have special meaning for the QQD.

II. Modern theorists who argue for the primacy of quantitative data over qualitative data have made a mistake that Kant made over 300 years ago, namely, the distinction between analytic and synthetic truths.

III. Quantitative researchers may argue that numbers get us closer to the truth than qualitative inquiry. In fact, quantitative research depends on a few very ambiguous words to describe its findings.

Whereas this paper may have implications for disciplines beyond teacher education and technology, I hope to point out that there exists a special emphasis for our work, not because our invesitigations are considerably different than others in education, but because we have the advantage of a short history and ill-defined direction to date. Because the discipline of technology and teacher education is emerging, the window to define the direction of disciplinary research is open. Furthermore, we do not yet have a truly landmark paper or set of papers that has the capability of directing the research agenda. For instance, most of the recent research in langauge arts education is qualitative in nature, a focus developed largely by a group of writers who value these methods over others (e.g., Graves, 1983). This influence could be considered a form of methodological hegemony. Indeed, it might be difficult to publish quantative research in many of the professional publications in language arts. The next several years, I suspect, will see technology and teacher education making decisions on its methodology. Where we are then has everything to do with where we are now.

I.

Dewey sprinkled his writings with numerous attacks on dualisms. It is, therefore, surprising to notice the extraordinary health of modern dualisms. Educational researchers can be heard talking freely about the theory/practice split, the cognition/emotion dichotomy, left brain/right brain, and, of course, the QQD. Phenix (1966) cogently describes Dewey's attack on dualisms, noting that Dewey warned his contemporaries that a focus on dualisms would encourage "the neglect of the more important connections and relationships which the solidification of these general categories encouraged" (p. 40). In essence, Dewey used the concepts of nature, experience, interaction, and continuity in his war on dualisms. He maintained that it was inappropriate to chop nature up into two parts (e.g., living/non-living, real/surreal). The world is a constant flux, ill-suited for easy categories, and that while dualisms may help to spur talk about the world, they do not necessarily help those who talk about it to understand it better. Bernstein (1986) states that "Dewey sought to unmask the tendency for philosophers to reify and hypostatize changing fluid, functional distinctions into metaphysical and epistemological dichotomies" (p. 263). In this respect, we are reminded that our language may decide for us how we are to understand our environment and therefore limit our understanding of it, although this is a point of much dispute.

Schon (1992) brings to mind Dewey's attack on the dualism created between higher and lower status knowledge and suggests that this dualism is really a vestige of ancient Greek social class structure. Schon goes on to show how this dualism has led many disciplines to create an education of "technical rationalty," one which carelessly ignores "conversations" with the practical in favor of a context-free learning and experimental environment.

A common dualism in teacher education and technology research spins on the purported difference between *abstract* "theoretical investigations" in technology and *concrete* software development. This dualsim is false namely because one cannot test, evaluate, or develop computer software in a theoretical or cultural vacuum. Any reseacher studying an educational issue cannot do so without an undergirding belief driving development. Even the most "applied" research has a theory on which to base expectations, even if that theory resembles what Maxine Greene calls a personal landscape (Greene, 1978). Nor can one develop a theory or write a theoretical paper without considering application. The world cannot be made to disappear when we

develop theory. Every theoretical idea has as its base the experience of the nearby environment. We should also be reminded that theory has its place and that a fascination with theory may detract us from finding new ways of thinking about the world. Santiago Ramon y Cajal, the founder of neuroscience, wrote early in this century: "To observe without thinking is as dangerous as to think without observing. Theory is our best intellectual tool; a tool like all others, liable to be notched and to rust, requiring continual repairs and replacements" (1989, p. 155). The notches and subsequent repairs in a theory are caused by interaction and testing in the experimental world. The concrete often rubs theory the wrong way, and the experimenter's task is to modify theory with the "backtalk" of the environment. The concrete cannot exist without the abstract nor vice versa.

In short, Dewey argued that the world does not exist in a binary mode. I suggest that the moment a community of inquirers believes a dualism exists, that dualism should be interrogated and shown to be untrue. Such proof is typically not hard to find.

II.

The second argument leading to the dismantling of the QQD hinges on the analytic/synthetic truth distinction. This debate, much older than the QQD, contains one of the key ingredients necessary for dismantling the QQD. It was Kant who first proposed the analytic/synthetic distinction, which he suggested cleaved sentences into two distinct classes: those whose truth depends on facts of matter (synthetic) and those whose truth depends on facts of meaning (analytic). For Kant, analytic propositions are (a) those in which the predicate is "contained in" the subject, (b) those in which the connection between subject and predicate is one of identity, (c) those which one cannot deny without being involved in a self-contradiction. Conversely, synthetic propositions are (a) those whose predicate not contained (b) not identity (c) and those in which one can deny without being involved in a self-contradiction. A common example of an analytic statement is "No unmarried man is married." One needs not appeal to the world for verification of the truth to the statement. No empirical check is required. It is analytic. However, the following statement, "Snow is white," cannot be confirmed without an appeal to facts (observation) found in the environment and is thought to be synthetic. Quine (1953) showed that this distinction is indeed false by pointing out that there are truth statements that fall into different divisions within what had once been considered

analytic statements. Harris and Severens (1970), in an introduction to Quine's "Two Dogmas of Empiricism" wrote:

Quine distinguishes between two kinds of supposed analytic statements: those which are logically true (or true by virtue of their form alone) and those which are true by virtue of meaning, not logically true but true because of their nonlogical content. The first kind invariably remain true under any uniform substitution for their nonlogical expressions. For example, "Every rose is a rose" remains true when "turtle" is subtituted for "rose" therein. Logical truths are truths which retian their truth no matter what systematic substitution is made for their nonlogical terms. On the other hand, the latter kind cannot be characterized so easily. Thus although "No bachelor is married" (which is not a logical truth , or true by virtue of its form alone) can be make into a logical truth by substituting "unmarried person" for bachelor on the basis of their purported synonymy, the matter is not closed. For the notion of synonymy is every bit as myterious as is the notion of analyticity. Characterization of the second class of analytic statements failing thus, the notion of analyticity itself remains incompletely analyzed. (pp. 23-24)

For the purposes of this discussion, however, it is important to focus on Kant's "mistake" in suggesting analyticity for mathematical statements. Kant maintained that a priori knowledge (the type needed to verify the truth of analytic statements) is independent of experience. Whereas he did believe that though all knowledge begins with experience, he did not suggest that all knowledge arises out of experience. Kant maintained that it is necessary to learn the concepts "5","+", "7", "=", "12." However, once learned, it is not necessary to rely upon experience to judge the truth of "5+7=12"; such knowledge is independent of experience and is therefore analytic. Quine illustrated that it is really impossible to characterize purely analytic statements. The analyticity of mathematical statements is challenged by the fact that there is no such thing as an analytic statement. Mathematics does have the illusion of being purely logical, and therefore analytic, but the way in which modern social scientists interpret this falsity is what gets them into trouble. The illusion that statements which involve numbers are often analytic (ones which rely only on logical terms to determine truth) has led many social scientist to believe that once a number is ascribed to a phenomena, the truth is fixed, no longer in need of further experience for verification.

Mathematical statements are not analytic because the analytic/synthetic distinction has been dismantled; therefore, the notion that numbers are somehow closer to the truth is a myth. Nor can we say that statements using words are synthetic or analytic. The truth of any statement requires a combination of logic and experience; every statement is a negotiated, temporal "truth."

III.

The third attack on the QQD is supported by Miller and Fredericks (1991) who argue for the value of indeterminacy (the fact that we all develop our own individual translation of what we believe to be common terms) in research in the human sciences. They argue that even when we believe that we have developed quantitative research, we inevitably find ourselves falling back on words, and thus to indeterminate meanings. For example, a social scientist is interested in the relationship between a certain instructional method and student achievement. Of course, the meaning of "instructional method" and "student achievement" may be vague, ambiguous, or both. For the purposes of this discussion, however, it would be most fruitful if we assumed that all concerned had assented to the meaning of these terms by deciding how they could be defined.

The ceremony of educational research requires our researcher to operationally define the constructs used. Having done so and conducted the research, it is discovered that a correlation of .50 is found between two constructs. Miller and Fredericks argue that it is at this point that ambiguity sets in. Is a correlation of this magnitude "strong" or "weak?" Certainly it is stronger than no correlation but it is considerably weaker than a perfect relationship. The terms we inevitably must use to describe this number (.50) are indeterminate; that is, we all must appeal to "meaning" when we interpret "strong", "weak", or "somewhat strong."

All those who know the ceremony and ritual in social science know the next move well: statistical significance. This strategy, however, does little to reduce the reliance on words even after we employ sophisticated mathematics to be "sure" of our results. Miller and Fredericks write, "In this version of trying to reduce methodological indeterminacy, one agrees that even though the correlation does not remove (or 'explain') the problem of accurate translation, the 'amount' that it does remove is (statistically) significant" (p. 365). Thus, unless we limit ourselves to a perfect correlation, it is still with vague words ("a low or high level of significance") we must discuss the results.

The problem cannot be solved with an appeal to more advanced techniques of statistical analysis. Again, while perhaps a larger percent of variance is "explained," some portion is left "unexplained." Researchers may now be able to describe how other variables or factors influence one or more other variables, the problem of significance has not been attenuated nor is there ever a guarantee that the model used to account for the variance is fully specified. Most quantitative researchers, of course, would not argue that the data can completely explain a phenomenon. However, most would argue that as a result of the experiment or data analysis, the "truth" is closer at hand.

Conclusions

As part of a larger critique of Enlightenment thinking, Richard Rorty has suggested that what now counts as science, that which is able to somehow stand outside of the flux of experience, like a Philosophy which can stand outside the world with a "God's eye view," does not exist. Rorty maintains that the way we describe the world has a good deal more to do with our vocabularies than with any correspondence to reality. Rorty calls a person who thinks this way an ironist. He wrote:

For the ironist, searches for a final vocabulary are not destined to converge. For her, sentences like "All men by nature desire to know" or "Truth is independent of the human mind" are simply platitudes used to inclucate the local final vocabulary, the common sense of the West. She is an ironist just insofar as her own final vocabulary does not contain such notions. Her descriptions of what she is doing when she looks for a better final vocabulary than the one she is currently using is dominated by metaphors of *making rather than finding* [italics mine], of diversification and novelty rather than convergence to the antecedently present. She thinks of final vocabularies as poetic achievements rather than the fruits of diligent inquiry according to antecedently formulated criteria (pp. 75-76)

He also makes clear that the rigid categories of the vocabularies that count as science or research often get in the way of alternative vocabularies. His question to an educational inquirer might be, "Are the representational resources (vocabularies) you are now using getting in the way of the use of other representational resources?" and avoid altogether the question, "Have you got it right?" The ironist teacher education researcher would focus on novelty rather than searching for the one best way to educate teachers, a fruitless venture, tantamount to asking "With better science and technology, we can

discover how to produce the perfect teacher." She would use her resources trying to uncover what has been ignored instead of perfecting what we already believe to be a promising line of research.

Rorty argues persuasively that modern notions of "science", "truth", and "objectivity" have come to carry too much weight and that we rarely recognize the load. Rorty (1991) suggests that we avoid such categories and suggests that as philosophers and scientists we engage in "less talk about rigor and more about originality" (p. 12).

The QQD, in my view, has very much been getting in the way of producing alternative vocabularies about teaching and learning. Nietzsche called the truth a "mobile army of metaphors," and in educational research, our metaphors are constrained by the false bifurcation of the QQD. We have let one set of vocabularies get in the way of others; our understanding of teaching and teacher education can be improved by creating better metaphors, not a better science. By limiting ourselves to metaphors of numbers and words that are ambiguously "grounded" in reality limits us to a language in which we are forced to play a silly game of "my metaphors represent reality better than yours." It was Wittgenstein (1958) who proposed that langauge was like a game among a set of players. In his argument, he pointed out that in the language game it was impossible to develop the perfect game, that there was no point in trying to find the perfect language, primarily because the game (langauge) must constantly change. New rules, new pieces, and new players will dominate. The only rule that governs any change is that at least a few other players have to agree upon the changes. After that, it is a new game. By comparing language to a game, Wittenstien maintained that the players use the language as a tool rather than making the object of the game the development of a language. Those who study technology and teacher education now have an opportunity begin their inquiry with a de-emphasis on the tools while focusing clearly on both the nature of the game and the subjects of inquiry themselves.

While much of modern educational research is tied to the QQD, there is no reason why those working in teacher education and technology research must subsribe to previous categories. We must maintain a level of creativity and even subversion in our research efforts. The field is new, there is little tradition before us and the tradition that exists may not be one that we wish to build upon. Let me share an example that I find illustrative: I recall watching a short television spot about a new software development company.

What surprised me most about the operation was the downright playfulness and sponeteneity of those who worked there. Squirtgun fights erupted during meetings of the board, shenanigans of all sorts were easy to find, yet this small company had developed an amazing peice of software that had garnered the market share for their product. The traditional categories (dualisms in part) of research and development had been blurred and the emphasis seemed not on getting the software right (although it comes to that eventually) but rather to develop new ways of looking at technology and how we could use it. In effect, they had come to develop alternative vocabularies. This kind of attitude toward technology and teacher education may point us in the right direction. Later in this paper, I describe a research program specific to teacher education and technology that may help to develop alternative vocabularies.

There are some signs that teacher education researchers are coming to understand the postmodern view of langauge (for a discussion of the implications of postmodernism in education, see Cherryholmes, 1989). In particular, I am encouraged by the recent work in the area of teacher research, mostly because teacher research offers a new way of finding out about the world (Goswami & Dixon, 1987). Because teacher researching developed in part as a reaction to tradition, quantitative research, it is not typically bound by the QQD. Teacher researchers tend to approach research in their own specific context by using whatever methods or vocabularies suit their needs. They fuse methods, create new terms, talk *directly* with students, observe them daily, and find conclusions about which they make no extra-worldly claims (they rarely claim wide generalization). What they often write or tell about in their research attempts is reminiscent of a story, and the story, as Barone (1992a, 1992b) has suggested, is powerful in both its ability to re-describe and empower.

Barone's (1992) recent work has placed literary story-telling on the same stage with what we now consider to be rigorous social science research. First, Barone points out that the research now conducted by those in education caters to a very small audience and that their research is never communicated directly to the public, but is instead transmitted to the press who then pass it along, perhaps incorrectly, to a wider audience, including , surprisingly, teachers who "do not read the research." The second version of traditional research describes the process by which most educational researchers gain the funding necessary to conduct their experiments. Because government grants are typically determined by an ideology, the independent thought of the educational researcher is

compromised. An illustrative example of how a political agenda creates funding, which in turn creates educational research, is the Bush Administration's emphasis on math and science education. Without any compelling evidence that students in the US are poor at math and science and getting worse, the US Department of Education offered large sums of money to those educational researchers who were willing to study how to improve test scores in these areas. In this design, the educational researchers are "deprofessionalized" by studying something which may have had no intial interest and politics decide the major research projects. Barone's answer is for educational researchers to engage in an "enhanced professionalism" by creating narratives (nonfictional stories) about education that can be read by all who are interested. He wrote that educational researchers must:

. . . strive to reverse the usual pattern of research-following-funding by going over the heads of government policymakers to the primary source of power in a political democracracy. We act to persuade the polity. We speak to them, not from a distance, not through texts that need translation by intermediaries, but directly and compellingly so that the public ceases to imagine teachers and schoolchildren as essetially negligent and malevolent characters in need of externally imposed discipline, and begins to understand the nature of the unfortunate cultural and institutional forces that impinge upon their lives. (p. 17)

An obvious omission in Barone's assertion is the QQD. Numbers and words are not distinguished as tools of inquiry in a type of research in which telling the story is more important than methodological rigor.

In the attempt to create alternative vocabularies, I would recommend that teacher educators help preservice students engage in their own research questions that result in their own story, their self-description of what they hope to become as teachers. Technology, rather than being a discrete chapter in their story, might weave in and out of the larger narrative.

Schon (1992) has recently suggested a similar strategy. He argues that university-based must come to engage in collaborative inquiry with classroom practitioners. In this effort, he maintains, researchers must view teaching practice as "a context for generating, not only for applying, usable knowledge" (p. 134). It is evident that Schon's focus, like Rorty's, is on invention and re-invention of knowledge instead of the application of

existing truths. And again, there is no mention of method. *Where* research takes place and *who* conducts and makes use of it receives the greatest attention.

Given these points, where does the discipline of technology and teacher education now stand? One obvious barometer is the recent publication, *Approches to research in teacher education and technology* (Waxman & Bright, 1993). In this edited monograph, each author takes on a category of established research and shows its potentional use (and, in some cases, potential misuse) in technology and teacher education. Does this comprehensive work suggest that the discipline is showing any signs of avoiding the qualitative/quantitative distinction? In examining the table of contents, we find a chapter on qualitative research methods, and another focuses on meta-analysis . Still another on quasi-experimental designs crafted by myself, of which I make no apologies. So the answer appears to be no. I chose the word "appears" because the chapter by Willis (1993) suggests a new direction for teacher education and technology. This bearing advocates invention in favor of what he calls the research-to-support-theory tradition. Not surprisingly, be makes no mention of the QQD, preferring instead to focus on the critical development of new technologies.

Nevertheless, there are good reasons for following the traditions. As a discipline emerges, it gains credibility by using the methods of the "masters." Waxman and Bright's (1993) monograph serves to establish technology and teacher education as a legitimate educational research enterprise. As a result, it essentially mirrors what has proved successful in other educational research. But these comments are not meant to suggest that the discipline has no recourse. Over time, those inside the discipline will be decided whether traditions are followed or discarded. There are good reasons, I believe, for not following the typical methods. First, as experts in technology, we are often viewed by practitioners as disconnected from the world of the classroom. This is unfortunate because technology shows such promise for making school more meaningful. Inaccessible research reports may serve to further alienate a large portion of our audience. Second, avoiding the QQD will encourage the discipline to engage in research agendas that do not follow the established pattern. For example, my collegues and I are currently at the University of Houston are at work on a research project in which teacher education students are helping us to improve an electronic mail communication system. Because we are not satisfied with text (ascii) based e-mail systems, we are out to create a communciations system with a graphical interface. Student input will be a key element

of the development, or invention, of an e-mail that works for everyone, not just those who enjoy using technology.

As we (teacher education students and myself) begin to help create alternative vocabularies in teacher education, we are using portable computers in several aspects of professional development. For instance, my teacher educators colleagues and myself at the University of Houston have recently initiated a field-based certification program, located in Professional Development Schools (PDS). Students participating in our PUMA program (Pedagogy for Multicultural and Urban Action) are encouraged to blur the lines between learning and teaching in school and learning and teaching in the larger community. In that spirit, several students have developed a parent English as a Second Language program located in one of the apartment complexes across the street from their field-based elementary school. Their goal is to develop oral language proficiency in monolingual Spanish-speaking parents so that these parents, who have had limited involvment in their child's school experience, will be able to participate in parent-teacher conferences conducted in English. Portable computers are also a feature of the PUMA program. In mixing technology with an urban community-based, social service focus, our students will be forced to arrive at new uses of the technology. One innovation has already emerged. We have brought the parents into the school's computer laboratory and allowed them to explore a Hypercard tutoring system we developed. The students felt to need to develop our own flexible computer-based instructional program for the parents despite the availability of commercially produced English tutoring systems. Two circumstances prompted the new development. First, unlike most commerical products, our goal for the parents' language acquisition was context specific (i.e., school language only). Such a specific use product was not available. Second, as is often the case, the commerical programs that suited our needs were too expensive. Although this first innovation has proved effective and instructive for our teacher education students, we expect many other innovations to follow.

As we document our "teacher research," we expect the power of our narrative to convince others of the value of technology in teacher education settings. Rather than a true "experiment" (either qualitative or quantitative) we will focus our efforts on re-invention rather than on methodological conformity. Of course, when we have documented our experiences in the urban, multilingual PDS, we will tell our story, even it is only to each other. Whether or not there will exist an outlet for our work is the central

concern of this paper. Will the discipline be so constrained by the QQD that our work will not "fit"? If our narrative concentrates on the social and cultural dimensions of our experiences and treats technology as one of several ancillary features that helped to invent the program, will it still have a home in technology and teacher education? These questions will be answered in part by the direction of the discipline, which will, in turn, be affected by the QQD.

In summary, the QQD debate should end, not because one methodology is better at finding the Truth, but because the distinction is a false one and the vocabularies created by it limit our ways of discovery.

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